UCLouvain

linma2171

2020

Numerical Analysis : Approximation, Interpolation, Integration

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 22.5 h	Q1

Teacher(s)	Absil Pierre-Antoine ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	• Interpolation • Function approximation • Numerical integration
Aims	• AA1.1, AA1.2, AA1.3 At the end of the course, the student will be able to: • Implement, in concrete problems, the basic knowledge required from an advanced user and a developer of numerical computing software; 1 • Analyze in depth various methods and algorithms for numerically solving scientific or technical problems, related in particular to interpolation, approximation, and integration of functions. Transversal learning outcomes : • Use a reference book in English; • Use programming languages for scientific computing. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Homeworks, exercises, or laboratory work during the course semester • Exam Precisions are given in the course outline (plan de cours) available on Moodle.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Lectures • Homeworks, exercises, or laboratory work under the supervision of the teaching assistants
Content	• Polynomial interpolation: Lagrange's interpolation formula, Neville's algorithm, Newton's interpolation formula, divided differences, Hermite interpolation. • Interpolation by spline functions : cubic spline interpolation, B-splines. • Rational interpolation. • Trigonometric interpolation. • Orthogonal polynomials : Legendre polynomials, Chebyshev polynomials. • Polynomial minimax approximation : existence, de la Vallée-Poussin's theorem, equioscillation theorem, uniqueness, Chebyshev interpolation. • Polynomial approximation in the least-squares sense. • Numerical integration : Newton-Cotes formula, Gauss method. • Integration of differential equations : introduction to the finite element method. • Other topics related to the course themes.
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=5443
Bibliography	• Ouvrage de référence • Documents complémentaires disponibles sur Moodle. Des précisions sont fournies dans le plan de cours disponible sur Moodle.

Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Mathematics	MATH2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		